

These strictly preliminary observations suggest that *D. eurekaensis* is most likely pollinated by short-tongued sarcophagid flies and perhaps secondarily by wasps and syrphid flies. Few species pollinated by generalist flies have been studied thoroughly, and more information on this type of pollination system would be useful. It also would be interesting to investigate reproductive success in more depauperate *De-deckera* populations such as that at ca. 1100 m in the Last Chance Mountains east of the Eureka Dunes, which consists of only two plants.—DELBERT WIENS, Dept. of Biology, University of Utah, Salt Lake City 84112; MARY DeDECKER, Box 506, Independence, CA 93526; and CAROL DeDECKER WIENS, 1763 Ann Dell Lane, Salt Lake City, UT 84121. (Received 21 Nov 1985; revision accepted 17 Jul 1986.)

SOME RESPONSES OF *Sidalcea calycosa* (MALVACEAE) TO FIRE.—Fire in California's introduced annual grassland is commonplace, but its effects usually are limited in extent and duration (Heady, *In* M. G. Barbour and J. Major, eds., *Terrestrial vegetation of California*, Wiley Interscience, 1977). Fires from the grassland frequently burn into the adjacent, predominately native vegetation of vernal pools where the role of fire has not been examined. To begin evaluation of the effects of fire on vernal pool plants, density and fruit production were studied in burned and unburned portions of a population of *Sidalcea calycosa* Jones. The autecology of this annual California endemic, which is common to some vernal pool margins and similar areas, has not been investigated previously.

Study site. The study site is at an elevation of 75 m and 1 km east of Chico, Butte Co., California. The topography is mostly flat with several channel-like depressions about 5 m wide and 0.25 m deep that are separated by broad mounds less than 1 m in height. These depressions are without natural outlets and maintain standing water for a maximum of about ten days following rainfall. Soil type is Tuscan stony clay loam (Watson et al., *Soil Survey Chico Area*, U.S.D.A., 1929). *Sidalcea calycosa* is the most abundant plant in the depressions; associates include *Limnanthes floccosa* Howell subsp. *californica* Arroyo and *Eryngium vaseyi* Coult. & Rose var. *vallicola* Munz. *Erodium* spp. and *Bromus mollis* L. are common in the annual grassland between the low areas. The climate is Mediterranean with an average rainfall of 660 mm; precipitation in the 1984–85 wet season was 512 mm and for 1985–86 was about 835 mm. Average daily temperatures for January and July 1984 were 8°C and 28°C (Chico Univ. Farm, Climatological data, Chico, CA. 1984–86). Domestic live-

TABLE 1. MEAN NUMBER OF FRUITS PER PLANT OF *Sidalcea calycosa* IN BURNED AND UNBURNED AREAS AT THE END OF THE FIRST AND SECOND POST-FIRE SEASONS. Three plants in the southeastern corner of each quadrat were evaluated; 120 plants were used for each treatment in the first season; excluding quadrats infested by *Colletotricum malvarum* during the second season, n = 84 and n = 39 plants for burned and unburned areas, respectively; values are \pm one standard error; ns = p > 0.05; s = p < 0.001.

Season	Burned areas	Unburned areas	p
First	5.4 \pm 0.33	3.4 \pm 0.19	s
Second	1.71 \pm 0.17	1.21 \pm 0.23	ns

TABLE 2. MEAN DENSITY OF *Sidalcea calycosa* IN 1.5×2.0 DM QUADRATS IN BURNED AND UNBURNED AREAS DURING FIRST AND SECOND POST-FIRE SEASONS. Total number of individuals in quadrats for each treatment for each season are in parentheses; 40 quadrats were used for each treatment both seasons; values are mean \pm one standard error; ns = $p > 0.05$; s = $p < 0.01$.

Season	Burned areas	Unburned areas	p
First	23.6 ± 2.25 (944)	30.9 ± 3.05 (1234)	ns
Second	23.8 ± 1.9 (952)	12.0 ± 1.7 (479)	s

stock have not grazed here for at least five years. In early July 1984, a wildfire burned a portion of the site during hot, dry, and windy conditions.

Methods. Transects were placed systematically across depressions. For every transect in the burn, a corresponding transect was placed in the same depression, but at an unburned location with similar width, depth, and continuity of plant cover. Five 1.5×2.0 dm quadrats were located within depressions at 1 m intervals along each transect. Eight transects yielded 40 quadrats for each treatment. Prior to peak flowering in the first post-fire season (1 April 1985), the number of individuals per quadrat and the proportion of these in flower were measured. At the end of the growing season (5 May 1985), the number of fruits on the three plants in the southeastern corner of each quadrat were counted. During the second post-fire season (19 March 1986), the number of individuals per quadrat were measured again. During late March and early April 1986 an outbreak of the parasitic fungus *Colletotricum malvarum* (A. Br. et Casp.) Southw. caused extensive plant mortality before seed set in 12 of the burn quadrats and 27 of the unburned quadrats. On 29 March 1986, the proportion of early flowering plants in quadrats unaffected by the pathogen was determined and on 26 April 1986 the final number of fruits on the three plants in the southeastern corner of the unaffected quadrats were counted. Chi squares were used to determine if proportions were significantly different, and a one-way ANOVA was used to determine if means were significantly different.

Results. Thirty two percent of the plants in the burned area were flowering by 1 April 1985 compared to 6% of the plants in the unburned area. Larger plants also were observed in post-burn areas at this time. The difference in the proportions of early flowering individuals between treatments in the first season was significant ($p < 0.001$). On 29 March 1986, 19% of the plants in burned locations and 15% of the plants in unburned locations were in flower. The difference in proportions of early flowering individuals in the second post-fire season was not significant. Although significantly more fruits per plant were produced at burned locations during the first season, no difference in fruit production between treatments existed during the second season (Table 1). The specific factors that caused more vigorous early flowering and increased fruit production in the first post-fire season are unknown for *Sidalcea calycosa*. In some grassland herbs, a similar increase in flowering activity follows litter removal, which allows the unshaded young plants to grow earlier and more efficiently (Daubenmire, Ecology of fire in grasslands, Advan. Ecol. Res., 1968).

Table 2 compares the density of *S. calycosa* in burned and unburned areas for the first and second post-fire seasons and shows a significantly greater number of individuals per quadrat in the burned area only during the second season. Interpretation of the density data is difficult, but higher densities in the burned area during the second season following fire may be due to the larger seed crop produced here the first season.

Discussion. Fire may be important to *Sidalcea calycosa* by reducing sources of inoculum for pathogens that can hamper fruit production. Unburned quadrats had

increased *Colletotricum malvarum* infestation and the degree of infestation decreased with increasing distance away from the unburned area. The direct role of fire in the reproduction of this vernal pool species, however, is limited because increased flower and fruit production were not apparent after the first post-fire season.

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VESTA FLORENCE HESSE, 1901–1982.—Vesta Hesse was a keen observer of variability in plants and one of the most astute students of the flora of Santa Cruz Co., California. Her botanical collections resulted in a greater completeness of the *Flora of the Santa Cruz Mountains of California* (Thomas, J. H., Stanford University Press, 1961). In 1982 in honor of her botanical contributions, she was elected Second Vice-President of the California Botanical Society. Her name is commemorated in *Calyptridium parryi* Gray var. *hesseae* Thomas, an endemic of the Santa Cruz Mountains.

Vesta Hesse, next to youngest of eight children, was born and grew up on the outskirts of Boulder Creek, Santa Cruz Co., where her father had settled in 1885. She attended the University of California where she majored in Physics, graduating in 1924. After two years of teaching high school at Angels Camp, Calaveras Co., she decided that teaching was not her forte. The “Depression” of the period made it difficult to find a position elsewhere, so, following the death of her father in 1930,

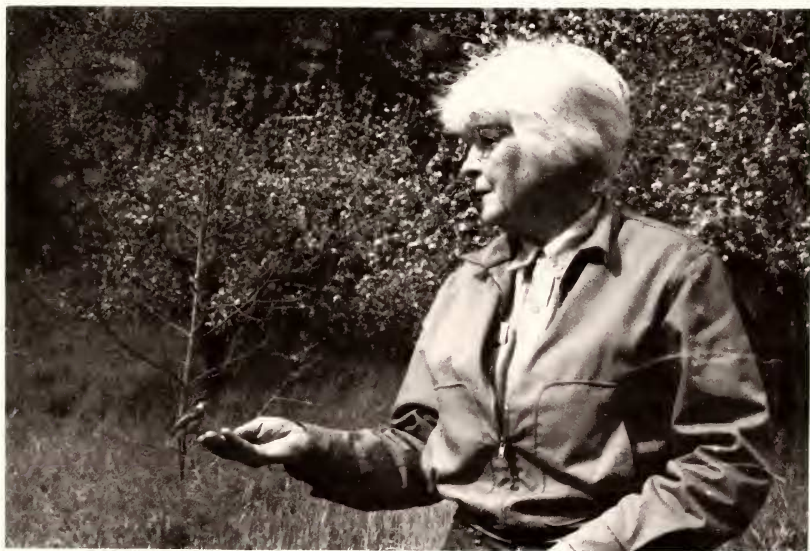


FIG. 1. Vesta Hesse feeding a chickadee.